

REMARKS

In the Office Action, the Examiner rejected claims 11-14 and 21-22 under 35 U.S.C. 103(a) as being unpatentable over Lin (5,830,800), in view of Shinohara (6,358,778), claims 15-19 under 35 U.S.C. 103(a) as being unpatentable over Lin, in view of Shinohara, and further in view of Nakashima et al. (5,075,760), and claim 20 under 103(a) as being unpatentable over Lin, in view of Shinohara, and further in view of Wang et al. (6,258,626). The rejections are fully traversed below. Reconsideration of the application is respectfully requested based on the following remarks.

Claim 11 has been amended to further clarify the subject matter regarded as the invention. The amended language of claim 11 has support in the specification at FIGS. 9 and 16, as well as in other locations within the specification. New claims 23-29 have been added. Claims 11, 13-16, and 18-29 are now pending in this application.

PATENTABILITY OF CLAIMS 11-29

Independent claim 1 of the present invention requires removing a thin portion of the connecting sheet between each of the lead posts so that oversized contact pads are formed on the bottom surface of the packaged integrated circuits wherein the oversized contact pads have a diameter that is larger than the diameter of each of the lead posts. The oversized contact pads are advantageous in that they provide larger contact surfaces for attaching a packaged integrated circuit onto a substrate such as a printed circuit board and thereby allow assembly processes to be performed with lower positional tolerances. In contrast, none of the cited references of Lin and Shinohara teach or suggest removing thin portions of a connecting sheet to form oversized contact pads wherein the diameter of the contact pads is larger than the diameter of the lead posts.

Independent claim 25 requires providing a conductive lead frame having an imperforate connecting sheet and an array of integrally formed lead posts. Neither Lin, Shinohara, Nakashima et al., nor Wang et al., alone or in combination, teach or suggest a lead frame having an imperforate connecting sheet and an array of integrally formed lead posts. For instance, Lin does not teach or suggest a lead frame having a connecting sheet that has integrally formed lead posts. Also, Shinohara does not teach or suggest an imperforate connecting sheet since lead frame 1 has “half-punched” holes resulting from the formation of the protruding terminals 2. Since the cited references do not teach or suggest all of the claim limitations of claims 11 and 25, it is submitted that claims 11 and 25 are patentably distinct from the cited references.

It is submitted that dependent claims 12-24 and 26-29 are also patentably distinct from Lin, Shinohara, Nakashima et al., Wang et al., and Tamaki et al. for at least the same reasons as those recited above for their corresponding independent claims. These dependent claims further recite additional limitations that further distinguish these dependent claims from the cited references. For example, dependent claims 28 and 29 require a single flat molding panel that encapsulates multiple semiconductor dice. Again, these limitations are not taught or suggested by the cited references. Thus, it is respectfully requested that the Examiner withdraw the rejection of claims 11-20 under 35 U.S.C § 103(a).

SUMMARY

It is respectfully submitted that all pending claims are allowable and that this case is now in condition for allowance. Should the Examiner believe that a telephone conference would expedite the prosecution of this application, the undersigned can be reached at the telephone number set out below.

If any fees are due in connection with the filing of this Amendment, the Commissioner is authorized to deduct such fees from the undersigned's Deposit Account No. 500388 (Order No. NSC1P194).

Respectfully submitted,
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**SUMMARY DOCUMENT:
STATUS OF ALL CLAIMS AND TEXT OF ALL PENDING CLAIMS**

Claims 1 – 10 (Canceled)

11. (Currently Amended) A method for packaging integrated circuits, comprising:
providing a lead frame of a conductive material with an array of lead posts that are
equally spaced apart and a connecting sheet connecting each of the lead posts;
attaching a plurality of first dice to the lead frame, wherein each first die is electrically and
mechanically connected to a plurality of lead posts within the array of lead posts, and wherein a
conductive side of each first die faces the lead posts; **[and]**
encapsulating the plurality of dice with an encapsulating material; and
removing a thin portion of the connecting sheet between each of the lead posts to
electrically isolate each of the lead posts wherein an unremoved portion of the connecting
sheet remains connected to each lead post and forms an oversized contact pad on a bottom
surface of the packaged integrated circuits, wherein the oversized contact pad has a
diameter that is larger than a diameter of each of the lead posts.
12. (Cancelled)
13. (Original) The method, as recited in claim 12, further comprising singulating the
encapsulated first dice.
14. (Previously Amended) The method, as recited in claim 13, wherein attaching the
plurality of first dice to the lead frame comprises placing a conductive epoxy between conductive
pads on the plurality of dice and each of the lead posts.
15. (Original) The method, as recited in claim 14, further comprising testing the integrated
circuit packages as a panel before the step of singulation.
16. (Original) The method, as recited in claim 15, wherein the removing of the connecting
sheet forms lead fingers.
17. (Cancelled)

18. (Previously Amended) The method, as recited in claim 17, wherein the conductive side of a die of the plurality of dice comprises a plurality of spaced apart conductive pads, wherein the conductive epoxy electrically and mechanically connects each conductive pad to one of the lead posts.

19. (Previously Amended) The method, as recited in claim 18, wherein the placing the conductive epoxy comprises:

placing the conductive epoxy on an upper surface of each of the lead posts; and

placing a plurality of dice so that each conductive pad is placed into conductive epoxy on an upper surface of a lead post.

20. (Previously Amended) The method, as recited in claim 13, further comprising:

attaching a plurality of second dice to the plurality of first dice, wherein each second die has a conductive side and a side opposite the conductive side, wherein the side opposite the conductive side of each second die is connected to a side opposite the conductive side of a first die, wherein each second die has a plurality of conductive pads on the conductive side of the second die; and

wirebonding conductive pads of each second die to lead posts of the array of lead posts of the lead frame, wherein encapsulating the plurality of first dice encapsulates the plurality of second dice.

21. (Previously Added) A method as recited in claim 11 wherein at least three die are connected to lead posts within the array of lead posts.

22. (Previously Added) A method as recited in claim 11 wherein the array of lead posts is at least ten by ten in size.

23. (New) A method as recited in claim 11 wherein the removing of the thin portions of the connecting sheet is performed by passing a rotating saw blade over the connecting sheet.

24. (New) A method as recited in claim 11 wherein the connecting sheet is imperforate and wherein the array of lead posts are integrally formed with the connecting sheet and extend from a top surface of the connecting sheet.

25. (New) A method for manufacturing a packaged semiconductor device comprising:

providing a conductive lead frame having an imperforate connecting sheet and an array of integrally formed lead posts that extend from a top surface of the connecting sheet;

attaching a plurality of semiconductor dice onto the lead frame wherein a first surface of each die, which has contact pads, is placed in contact with the array of lead posts;

applying liquid molding material over the dice and lead frame such that the molding material fills in voids between the lead posts and covers the dice.

26. (New) A method as recited in claim 25 further comprising:

removing a thin portion of the connecting sheet between each of the lead posts to electrically isolate each of the lead posts wherein an unremoved portion of the connecting sheet remains connected to each lead post and forms an oversized contact pad on a bottom surface of the packaged semiconductor device, wherein the oversized contact pad has a diameter that is larger than a diameter of each of the lead posts.

27. (New) A method as recited in claim 26 further comprising:

singulating each of the packaged semiconductor devices from the lead frame.

28. (New) A method as recited in claim 25 further comprising:

curing the liquid molding material so that a single flat molding material panel encapsulates multiple semiconductor dice.

29. (New) A method as recited in claim 11 wherein the encapsulating material is formed into a single flat panel that encapsulates the plurality of dice.